No. 636,710. Patented Nov. 7, 1899.

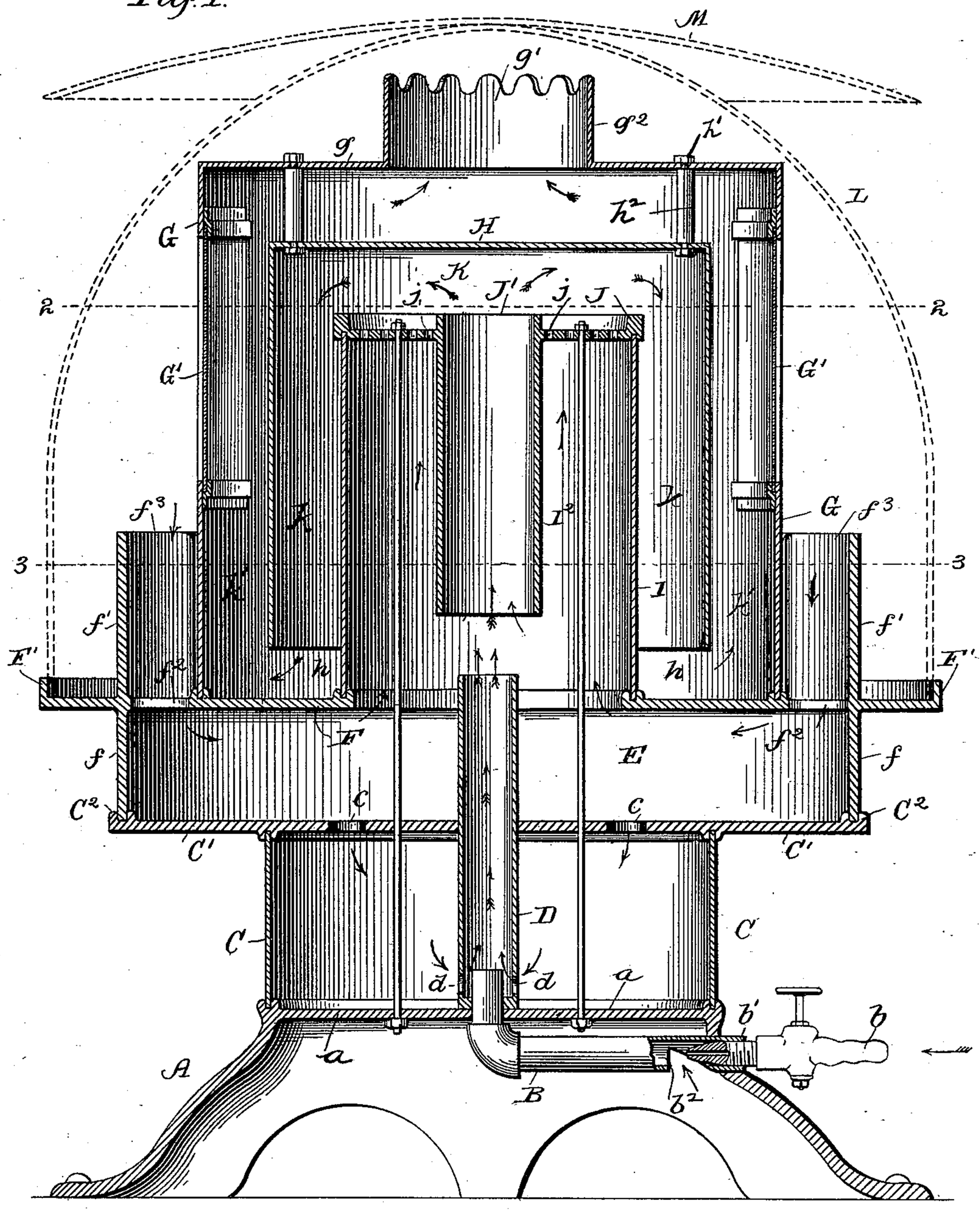
V. W. BLANCHARD.

GAS STOVE.

(Application filed Apr. 30, 1898. Renewed Aug. 21, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses.
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Fig. 2.

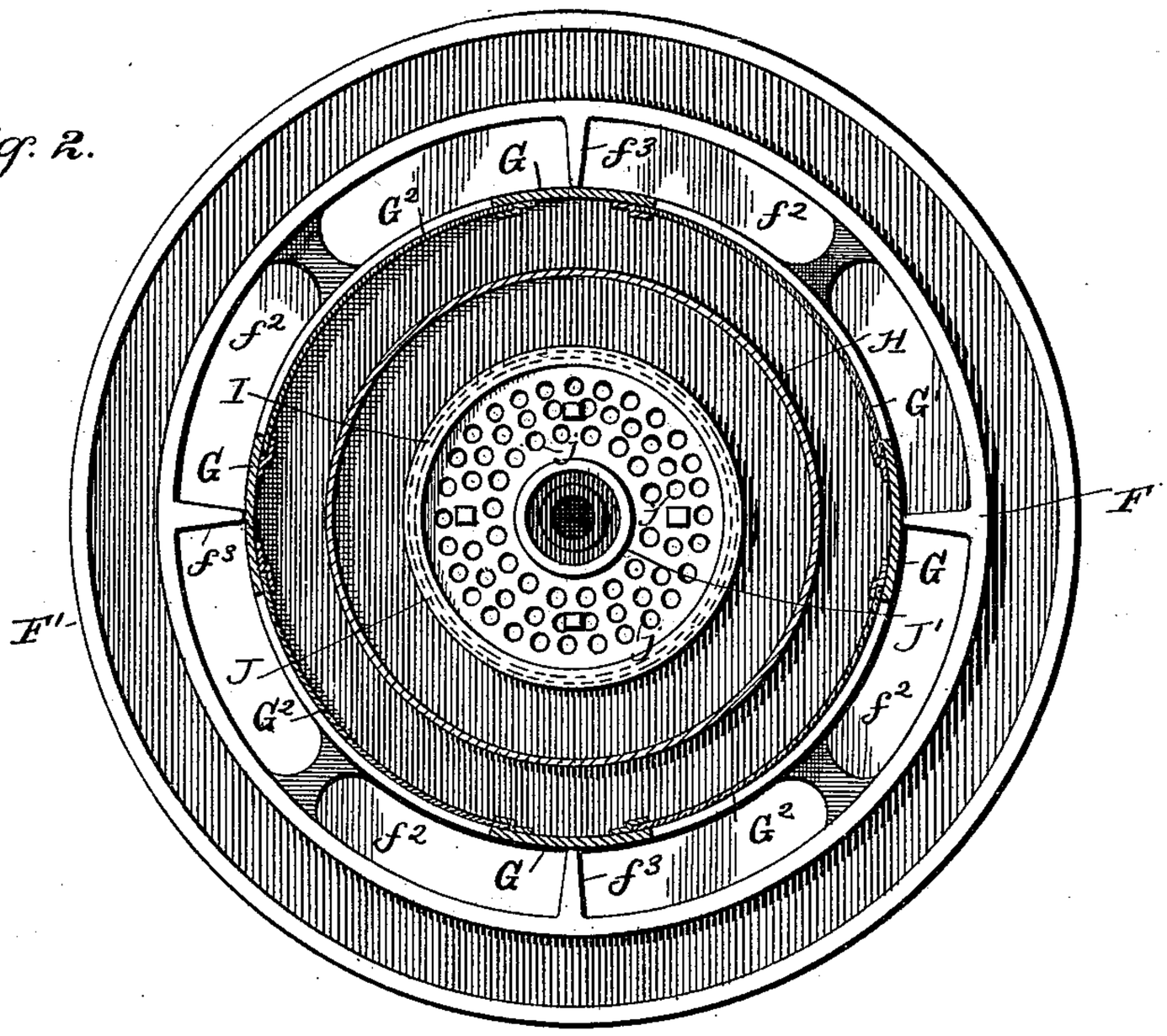
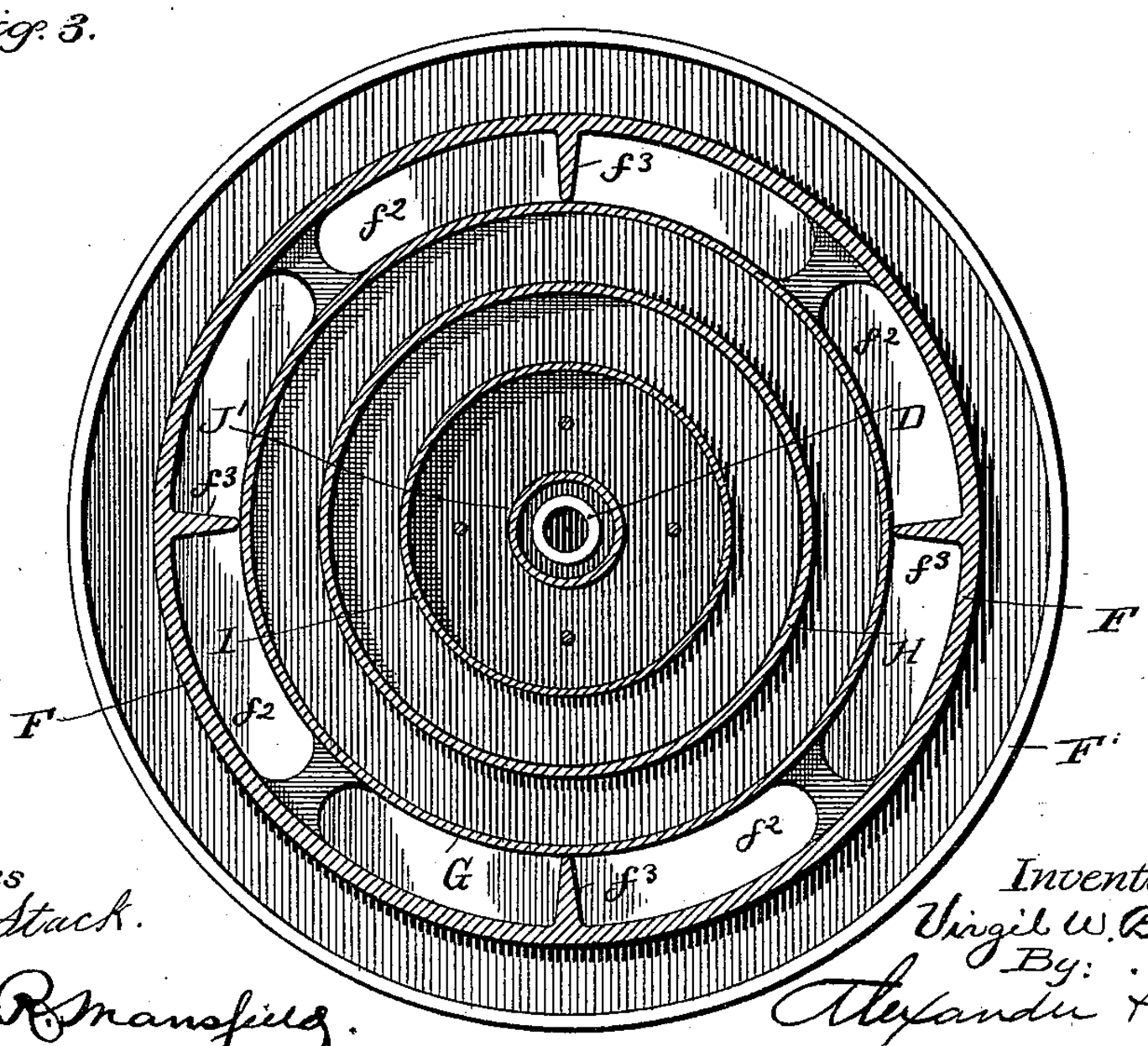


Fig. 3.



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UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y.

GAS-STOVE.

SPECIFICATION forming part of Letters Patent No. 636,710, dated November 7, 1899.

Application filed April 30, 1898. Renewed August 21, 1899. Serial No. 727,979. (No model.)

To all whom it may concern:

Be it known that I, VIRGIL W. BLANCHARD, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Gas-Stoves; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in gas-stoves; and its object is to so construct the same as to produce intense heat.

My improved apparatus is so constructed that the gaseous fuel is repeatedly subjected to the oxidizing effects of heated air introduced therein at different points in its progress through the apparatus, the final combustion taking place within an inverted-dome-shaped combustion-chamber which is heated to incandescence and may be inclosed within a casing provided with side openings closed by mica or other transparent refractory material, so that the light from the heated dome can be diffused around the apparatus.

The apparatus is also designed with an eye to simplicity and economy of construction, as well as with a view to attaining approximately the complete oxidation of all the combustible elements in the gaseous fuel and to increase the economy of the apparatus by the consumption of the oxygen in large quantities in the heated air.

The invention therefore consists in the novel construction and combination of parts hereinafter described and claimed whereby the desired ends are attained.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through the complete gas-stove. Fig. 2 is a transverse section of the same on line 2 2, Fig. 1. Fig. 3 is a section on line 3 3, Fig. 1.

Referring to the drawings, A designates the base of the apparatus, which is provided with an imperforate top *a*, through the center of which projects the upturned end of a gas-inlet pipe B, to which gas is supplied from the service-pipe through a valved nipple *b*, which is connected to pipe B by a small jet *b'*, so that the gas admitted into pipe B is supplied immediately with a modicum of air at the jet *b'*, as shown. Upon this base B is supported an imperforate cylinder C, upon which is supported a plate C' of greater diameter than the cylinder, having perforations *c* in its top to admit air into the upper end of the cylinder, as shown.

Supported upon base A and projecting through a central opening in plate C' is a tube D, the lower end of which surrounds the upturned end of pipe B and is provided with air-inlets *d* around the end of pipe B, so that as the gas enters tube D from pipe B a second modicum of warm air will be supplied thereto through the openings *d*.

The plate C' forms the bottom of an air-heating chamber E, the top and sides of which are formed by a casting, which has an annular portion or plate F, forming the top of the chamber E, said plate being of larger diameter than plate C' and projecting beyond the same and has a depending annular flange *f*, which fits into peripheral grooves C^2 at the outer end of plate C', and said flange *f* forms the outer wall of the air-heating chamber E. The casting also has an upstanding flange *f'* and is provided with an annular series of perforations f^2 at the base of and to the inside of flange *f'*, by which air can enter the chamber E.

Supported on plate F and just within the openings f^2 is a casing G, whose top *g* is provided with a central opening *g'* for the escape of products of combustion, surrounded by an upstanding flange g^2.

Within the casing G and suspended from the top thereof is an inverted-cup-shaped shell H, the top of which is imperforate. The side walls of shell H terminate above the plate F, leaving a space *h* for the passage of the products of combustion. Within the shell H and supported upon plate F is a cylinder I, which surrounds the central opening in plate F and rises to near the top of shell H, and its upper end is closed by a perforated casting J, which has a central depending tube J', which lies directly above the tube D, so that the gases escaping from tube D pass into the tube J' and in so doing draw thereinto another modicum of hot air from the chamber E. This tube J' is what I term the "primary combustion-chamber," as therein the initial combustion takes place, and the walls of said tube become very hot and assist in heating the air in the annular passages I^2 exterior

thereto. The plate J has numerous perforations *j* in it surrounding the upper end of tube J′, so that the hot air can pass up through the cylinder I and escape into the shell H from the perforations in casting J, as shown.

The space K above the plate J and within the upper end of shell H forms the secondary and principal combustion-chamber of the apparatus.

The casing G can be centered upon plate F by means of radial ribs f^3, projecting inward from the flange *f*′ of plate F. If desired, the casing G may be inclosed in a suitable hood L, supported in the annular extension F′ or plate F, as shown, and on this hood may be placed a deflector M, as shown in dotted lines in Fig. 1. The casing G may be provided with light-openings closed by plates of mica or other suitable non-refractory material G′, so that the light from the incandescent shell H may radiate through these openings.

In the drawings the featherless arrows indicate the air, the half-feathered arrows indicate the gas, and the full-feathered indicate the products of combustion or the commingled air and gases. The shell H is suspended rigidly in position within the casing G by the nutted bolts *h*′, surrounded by sleeves h^2. The parts J, F, C′, C, and A may be securely locked together by means of tie-rods N, as indicated in the drawings.

In the operation of my invention the casing G and shell H are removed and the gas ignited at the upper end of tube J′. Then the shell and casing should be replaced. The gas issuing under pressure into tube B through jet *b*′ takes in the first quota of air through the aperture b^2 in the pipe. The mixed gas and air then passes through tube B into tube D and therein takes to itself another second quota of air through the perforations *d*. The current of gases flowing from tube D into tube J′ will take to itself still another quota of air from the chamber E through the space between the said tubes, and the mixture burns in tube J′ as the primary combustion-chamber, and the products of combustion passing up the entire length of tube J′ are delivered into the secondary combustion-chamber K at the upper end of shell H, quickly raising the top of said shell to a very high temperature and highly heating the walls of the descending and ascending flues *k* and *k*′, respectively, between the cylinder I and shell H and between the latter and casing G, the heated current of gases finally escaping through the outlet *g*′, as is evident. Heated air is admitted to the tube D and combustion-chambers from the chamber E, and currents of fresh air will be drawn into said chamber by the suction of the outgoing currents of heated gases, and this heated air from chamber E will be more or less forcibly injected into the burning gases at the points *d*′, perforations *j*, and at the opening between the tubes D and J′, as shown. When the heat in the chamber K reaches its maximum of intensity, which is evident by the wall of the shell H becoming incandescent, the temperature of the air in chamber E will be proportionately increased before it is injected into the burning gases. In fact, before the air enters the combustion-chambers it is heated approximately to the temperature in said chambers. As the air passes upward around tube J′ it is subjected to the heat of the combustible gases within said tube and also to the heat of the burning gases in the flue *k*′. By this means a suitable volume of highly-heated air is added to the partially-consumed burning gases in the primary combustion-chamber or tube J′ and a still larger volume of more highly-heated air is injected into the intensely-heated products of combustion in the secondary combustion-chamber K through the concentric series of perforations *j*′, whereby approximately complete oxidation of all the combustible elements in the fuel is realized.

It is well known that by injecting into ignited heated gases fresh air heated to a temperature approximating that of such gases less air is required to attain the combustion of the gases than would be otherwise necessary. It is also known that by introducing hot air in small quantities at various points into a current of burning gases a more successful and gradual oxidizing of such gases is realized and the temperature of the products of combustion regularly increased instead of being lowered by the introduction of the air. These known facts are utilized in my improved stove, wherein I supply partially-consumed burning gases with fresh air heated to a temperature approximating that of the gases, thereby effecting the combustion of the latter with the least expenditure of air that is possible and realizing the highest temperature in the combustion-chamber K. It will be observed, therefore, that the current of air entering and traversing chamber E moves in the opposite direction to the current of gases traversing chambers J′ and K and passages *k k*′, and it therefore results that the heat absorbed by the air is taken from the products of combustion after complete oxidation of the gases has been effected and is immediately returned to the hot gases into which the air is ejected without loss by external radiation. Hence in my invention there is no loss of heat from the apparatus in heating air to an intense temperature for accomplishing the complete oxidation of the fuel.

During the passage of the ignited gases through the primary combustion-chamber or tube J′ the carbon contained in them is approximately reduced to carbonic oxid and the hydrogen to water, and it is in the passage of this mixture through the combustion-chamber K that the carbonic oxid (CO) in them is reduced to carbonic acid, (CO_2.) Therefore the resultant heated gases escaping at the outlet *g*′ are odorless and are free from the poisonous diffusible gaseous carbonic oxid

(CO) which is set free by the combustion of fuel in ordinary gas-stoves.

It is obvious that various modifications may be made in the form and construction of the apparatus within the scope of my invention, and therefore I do not consider it restricted to the specific device illustrated in the drawings.

It will be observed that the upstanding flange f' extends above the bottom of the flues $k\,k'$. It thus results that the cool air is caused to circulate first downward beside the lower end of passage k', then under said passage, and then upward through the central passage beside the flue k. Naturally the heat will be greatest at the bends in the flues, and therefore by using the flange f' more of this heat is utilized than would be the case if this flange were omitted.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. In a gas-stove, the combination of the air-heating chamber, the combustion-chamber above the same, the mixing-tube for conducting gas into the combustion-chamber, a cylinder exterior to the tube forming an air-passage beside said tube communicating at top with the combustion-chamber, through a series of perforations and descending and ascending combustion-flues exterior to the combustion-chamber and communicating therewith, for the purpose and substantially as described.

2. In a gas-stove, the combination of the air-heating chamber, the combustion-chamber above the same, a gas-inlet tube in the bottom of said air-chamber, a mixing-tube for conducting the gas into the combustion-chamber, a cylinder exterior to the tube forming an annular air-passage surrounding said tube and communicating at top with the combustion-chamber through a series of perforations and escape-flues for the products of combustion above the air-heating chamber, for the purpose and substantially as described.

3. In a gas-stove, the combination of a combustion-chamber, a gas-inlet, a tube for conducting the burning gases into said combustion-chamber, a cylinder exterior to the tube forming an annular air-passage surrounding said tube for supplying air to the said combustion-chamber, and annular descending and ascending flues for the products of combustion, inclosing said annular air-flue and combustion-chamber, substantially as described.

4. In a gas-stove, the combination of an air-heating chamber, a combustion-chamber above the same, a gas-inlet in the bottom of said air-heating chamber, a tube for conducting the gases into said combustion-chamber, a cylinder exterior to the tube forming an annular passage surrounding said tube for supplying heated air to the said combustion-chamber, and annular descending and ascending flues for the products of combustion, inclosing said annular air-flue and combustion-chamber, and above the air-chamber, substantially as described.

5. In a gas-stove, the combination of an air-heating chamber, a combustion-chamber, ascending and descending flues leading from the latter, a mixing-tube for conducting gas to the combustion-chamber, a cylinder exterior to the tube, forming an annular air-passage leading from the air-heating chamber to the combustion-chamber, and a series of air-jets at the upper end of said passage for admitting air therefrom into said combustion-chamber, all substantially as and for the purpose set forth.

6. In a gas-stove, the combination of an air-heating chamber, a central gas-inlet tube therein, a cylinder exterior to the tube forming an air-passage above said gas-inlet tube, having a perforated plate closing its upper end, and a mixing-tube depending from said plate; with a combustion-chamber above said plate, closed at top and descending-flues leading from said combustion-chamber and surrounding the air-passage, substantially as and for the purpose described.

7. In a gas-stove, the combination of the cylinder, the tube suspended in said cylinder leaving an air-space between the tube and cylinder, and the inverted shell suspended over the tube and forming a combustion-chamber at the upper end thereof, and means for admitting gas into the lower end of said tube, and means for admitting air into the space around the tube for the purpose and substantially as described.

8. In a gas-stove, the combination of the base, the plate and casting supported thereon, forming an air-chamber, the cylinder supported on said chamber, the tube suspended in said cylinder leaving an air-space therebetween, the inverted shell suspended over the tube and forming a combustion-chamber at the upper end thereof, means for admitting gas into the lower end of said tube, and means for admitting air to said space, and from said space to the combustion-chamber and the escape-flues for the products of combustion, substantially as described.

9. In a gas-stove, the combination of the base, the cylinder, the tube suspended in said cylinder leaving an air-space therebetween, the inverted shell suspended over the tube and forming a combustion-chamber at the upper end thereof, means for admitting gas into the lower end of said tube, means for admitting air to said space, and from its upper end into the combustion-chamber and a casing inclosing said shell, substantially as and for the purpose described.

10. In a gas-stove, the combination of the base, the cylinder, the tube suspended in said cylinder, the inverted shell suspended over the tube and forming a combustion-chamber at the upper end thereof, means for admitting

gas into the lower end of said tube, and a casing inclosing said shell, substantially as and for the purpose described.

11. In a gas-stove, the combination of the base, the gas-supply pipe, the air-chamber, the vertical gas-mixing tube above the chamber into which the gas is admitted, the combustion-chamber at the upper end of said tube, a cylinder exterior to the tube forming the annular air-passage surrounding said tube, and annular ascending and descending flues communicating with the combustion-chamber and surrounding said air-passage, for the purpose and substantially as described.

12. In a gas-stove, the combination of the air-heating chamber, having a central vertical air-passage, a tube depending into said passage, and means for admitting gas into the lower end of said tube, and the inverted-cup-shaped shell suspended above said tube and surrounding said air-passage, and communicating therewith and spaced therefrom substantially as described.

13. In a gas-stove, the combination of the air-heating chamber having a central vertical air-passage, the perforated plate closing the upper end of said air-passage, a gas-mixing tube depending from said plate, and means for admitting gas into the lower end of said tube; with the inverted-cup-shaped shell suspended over said tube and surrounding said air-passage and spaced therefrom, and the casing exterior to said shell whereby is formed a combustion-chamber above the tube and descending and ascending flue passages exterior thereto, substantially as described.

14. The combination of the base, the gas-supply pipe, the cylinder supported on said base, the perforated plate closing the upper end of said cylinder, and the mixing-tube projecting through said plate; with a casting F supported on said plate and forming an air-chamber E, the cylinder supported on said casting F, a central depending tube in said cylinder and an inverted-cup-shaped shell suspended from the casing exterior to and spaced from said cylinder, for the purpose and substantially as described.

15. The combination of the base, the gas-inlet pipe, the cylinder supported on said base, the perforated plate closing the upper end of said cylinder, and the mixing-tube projecting through said plate; with a casting supported on said plate and forming an air-chamber E, the cylinder supported on said casting, the perforated plate J, supported on said cylinder, having a central depending tube J′, and an inverted-cup-shaped shell suspended from the casing exterior to and spaced from said cylinder and also spaced from the casing, for the purpose and substantially as described.

16. The herein-described gas-stove, consisting of the base A, the gas-pipe B, the cylinder C supported on said base, the perforated plate C′ supported on said cylinder, and the gas and air mixing tube D within the cylinder C, the casting F supported on the plate C′ and forming an air-chamber E, the cylinder I supported on plate F, and the perforated plate supported on the cylinder I and having a depending gas-mixing tube I, with the casing also supported on the plate F and the inverted-cup-shaped shell H suspended within the casing and inclosing the cylinder I but spaced therefrom, all substantially as and for the purpose described.

17. The herein-described gas-stove, consisting of the pipes A, the gas-pipe having gas and air mixing jet *b′*, the cylinder C supported on said base, the perforated plate C′ supported on said cylinder and the gas and air mixing tube D within the cylinder C; the casting F supported on the plate C′ and forming therewith an air-chamber E, and having upstanding flanges *f′*, the cylinder I supported on plate F, the perforated plate J supported on the cylinder I and having a depending gas-mixing tube J′, with the casing also supported on the plate F, the inverted-cup-shaped shell H suspended within the casing and inclosing the cylinder I but spaced therefrom, and the cover L and deflector M, all substantially as and for the purpose described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VIRGIL W. BLANCHARD.

In presence of—

JAMES R. MANSFIELD,

B. T. WEBSTER.